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Working Paper

Redistribution Through Taxation: An International Comparison

LIS Working Paper Series, No. 44

Provided in Cooperation with:
Luxembourg Income Study (LIS)

Suggested Citation: Zandvakili, Sourushe (1990) : Redistribution Through Taxation: An International Comparison, LIS Working Paper Series, No. 44, Luxembourg Income Study (LIS), Luxembourg

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Luxembourg Income Study Working Paper Series

Working Paper No. 44

Redistribution Through Taxation: An International Comparison

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March 1990

(scanned copy)

Luxembourg Income Study (LIS), asbl

REDISTRIBUTION THROUGH TAXATION:

AN INTERNATIONAL COMPARISON*

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ABSTRACT

Income tax progression is studied using Generalized Entropy measures of inequality. Luxembourg Income Study data sets for eleven countries are used for international comparative purposes and analysis. Progressivity indices are generated using Generalized Entropy family as well as Atkinson measures. This is to test the robustness of our observation of tax progression in each country. We further our understanding by looking at pre and post income tax measures of inequality based on gross income as well as disposable income for the households. It is shown the decomposition property to be desirable in order to enhance our view of true inequality and the implication of taxes. Thus decomposition based on quintile, family sizes, and number of earners is conducted. This has allowed an interpretation of results that could be attributed to any of the above characteristics and components which are free of such group characteristics.

March 1, 1990

*I would like to thank John Coder of Luxembourg Income Study Program for technical support.

I. INTRODUCTION:

One of the basic consequences of income taxation is to modify the distribution of income. Thus the relative economic standing of households will get effected unless the tax is proportional. However it is preceived that in most cases the nature of income taxes are progressive. It is an accepted view that the progression in taxation should reduce overall income inequality among households. However this reduction of the overall inequality could be misleading in the sense that the between-group component of inequality could be rising while the within-group components is decreasing. While the decomposition of the post tax inequality move in different direction of pre tax decompositions. Thus if any judgement with regard to the degree of tax progressivity among nations is to be made, it is desirable to look at the decompositions of the overall inequality as well. In what follows I will investigate this matter by looking at pre and post tax income inequality based on gross and net incomes among households within several countries. For measurement purposes, Generalized Entropy family of measures are employed to test the robustness of our results. Decompositions of GE are provided to further enhance our view of changes in the size distribution of income. We will gauge the progressivity by looking at pre and post income tax distributions. We further compare our approach with those proposed by Blackborby and Donaldson (1984) and Kiefer (1985) using the Atkinson indices of inequality.

I employ Luxembourg Income Study household data sets for eleven countries currently in place. The countries are Canada, USA, Germany, Israel, Netherlands, Sweden, United Kingdom, France, Norway, Switzerland, and Australia. The nature of income inequality among households within each country and across them is investigated using the GE family of measures and its decomposability property. I further investigate the nature of tax progressivity in each country and provide a comparative analysis.

This paper outlines the methodology for inequality measurement and measurement of tax progressivity in section II. Sections III through VI provide discussion of the results with decompositions based on Quintile, number of earners, and family size respectively. Section VII provides discussion of tax progressivity based on two alternative measures using Atkinson measures. Section VIII concludes.

II. THE FRAMEWORK

I have chosen the generalized entropy measures since they possess a set of desirable properties which have been widely accepted. These properties are: scale independence, anonymity, principle of transfer, smoothness, decomposability, and principle of population. The inequality measure I(Y; n) is a function that depends on the population n, i = 1 ... n, where the income shares $y \in Y^n = \left\{ y = (y_1; \ldots ; y_n) \geq 0 \right\}$. This class of measures is defined as:

$$(1) \qquad I_\gamma(y) = \frac{1}{n} \sum_{i=1}^{n} (ny_i)^{\gamma+1} - 1/\gamma(\gamma+1) \quad \gamma \neq 0, \ \& \ -1$$

$$(2) \qquad = \sum_{i=1}^{n} y_i \text{ Log } (ny_i) \qquad \gamma = 0$$

$$(3) \qquad = \sum_{i=1}^{n} n^{-1} \text{ Log } (1/ny_i) \qquad \gamma = -1$$

It is shown that this family includes I_0 and I_{-1} as Theil's (1967) information measures. γ is the degree of inequality aversion. We have a situation in which for every γ their exists a different ordering and thus one can test for robustness to reduce the normative gesture in measurement. Also this family includes monotonic transformation of measures proposed by Atkinson (1970):

$$(4) \qquad I_\epsilon(y) = 1 - \left[1/n \sum_{i=1}^{n} (ny_i)^{1-\epsilon}\right]^{1/(1-\epsilon)} \text{ for } \epsilon \geq 0$$

It is evident that I_γ (y) and $I_\epsilon(y)$ are ordinarily equivalent for values of $\epsilon = -\gamma > 0$. For the value of $\gamma = 0$ this equivalency disappears. Also for $\gamma > 0$ Atkinson measures do not correspond to $I_\gamma(y)$.

The measurement of tax progressivity can be approached from (a) the concentration index, or (b) inequality index. The former approach in the measurement of progressivity can be seen in 1) Effective Progression; Musgrave and Thin (1948), 2) The Pechman - Okner Index, Pechman and Okner (1980), 3) The Reynolds-Smolensky Index, Reynolds and Smolensky (1977), 4) The Khetan Poddar Index, Khetan and Poddar (1976), 5) The Kakwani Index, Kakwani (1977), and 6) The Khetan - Poddar - Suits Index, Khetan and Poddar (1976). The above progressivity indexes are all based on the Gini index and concentration indexes. As we know the Gini index suffers from not satisfying some desirable social welfare axioms see Atkinson (1970), and Sen (1973). The latter approach assumes the existence of a social welfare function, and uses the concept of "equally distributed equivalent" introduced in Atkinson (1970). The redistributive effect through the use of Atkinson family of measures can be gauged by looking at the pre and post tax income distribution. Consider progressivity index:

$$(5) \qquad P_\epsilon = I_\epsilon(y_g) - I_\epsilon(y_d)$$

introduced by Kiefer (1985), where (y_g) and (y_d) are gross and disposable incomes respectively. This is a measure of absolute change. If $P_\epsilon > 0$, the tax is progressive; if $P_\epsilon = 0$, the tax is proportional; and if $P_\epsilon < 0$, the tax is regressive. This is an indicator of the amount by which the tax system has increased the level of equally distributed equivalent income given a social welfare function. An alternative approach is that introduced by Blackorby and Donaldson (1983) and it is given as:

$$(6) \qquad P^*_\epsilon = I_\epsilon(y_g) - I_\epsilon(y_d)/\left[1 - I_\epsilon(y_g)\right]$$

This index is normalized to zero and considers the percentage change. Thus if $P^*_\epsilon > 0$, the tax is progressive; if $P^*_\epsilon = 0$, the tax is proportional; and if $P^*_\epsilon < 0$, the tax is regressive.

In the spirit of Kiefer (1985), I will measure tax progressivity using the Generalized Entropy Family of measures. Consider:

$$(7) \qquad I^* = I_\gamma(y_g) - I_\gamma(y_d)$$

where we are looking at the distribution of income based on gross income (y_g) and disposable income (y_d). If $I^* > 0$, the tax is progressive; if $I^* = 0$, the fax is proportional; and if $I^* < 0$, the tax is regressive. This type of measure does not account for reranking of households as taxes are imposed and it is a measure of absolute change. However, since this class is decomposable, I^* can be shown as:

$$(8) \qquad I^* = I^b* + I^w*$$

where I^b* is the difference of the pre and post tax between-group component of inequality, while I^w* is the difference of average within-group inequality. The proportion of change in I^* due to I^b* is:

$$(9) \qquad D^b = I^b*/\left[I_\gamma(y_g) - I_\gamma(y_d)\right]$$

While the proportion attributed to the changes within-group is shown as:

$$(10) \qquad D^w = I^w * / \left[I_\gamma(y_g) - I_\gamma(y_d) \right]$$

Thus by definision $D^w + D^b = D^0 = 1$.

III. INCOME SHARE AND TAX PROGRESSIVITY

In most countries, income tax is the major source of government revenue. The consequence of income tax is that it modifies the distribution of income. That is because in most cases income taxes are progressive. Thus the relative purchasing power of households are altered. The rational for subscribing to such a tax has been subject of much debate. Accepting that government must raise revenue in order to provide services, and the fact that household income provides an elastic source of revenue while gross household income is growing has made progressive tax attractive. There are two equity principles in which have helped justifying progressive income taxation. On one hand, the "horizontal equity" necessitates that income units in similar economic standing be faced with similar tax liabilities. On the other hand "vertical equity", requires unequal tax contribution for each income unit depending upon their ability in order to equalize the sacrifice on a utility basis.

Assuming the above principles are desirable from welfare perspective, our objective is to investigate whether or not they are infact observed. In doing so, we assume households pull their incomes and either at the individual or household level they pay their income taxes. Consequently, we can observe the household's economic standing based on gross income (pre tax), and disposable income (after tax). The difference between the two distributions provides us with an index of progressivity. We can address horizontal and vertical equity by way of our decompositions as well as looking at the changes in within-group inequality.

Most studies rely on the changes in loranze curve for a particular

country based on pre and post tax income inequality for analysis. This has been done by using aggregated data or micro data for each country. Although this approach is appealing and provides positive information, it can mislead the analyst. That is if for a particular quintile the share of income has changed after taxes, one is not certain about the direction of change in inequality for that particular group. Thus further analysis based on the analysis of the within-group inequality is in order. Looking at table 1, pre and post tax income share for eleven countries are provided based on five quintiles. Quintile 1 represents those with least income while quintile 5 contain those with the highest incomes. There is clearly a transfer from the top 20% (Quintile 5) to the lower quintiles in all eleven countries. However in Canada, Germany, Israel, Netherland, United Kingdom, and Australia, there is transfer from the top 40% to the bottom 60% of the populations in each country. Those quintiles that share of post tax income has increased indicate that larger proportion of after tax income is being alocated to them. However due to the differential in treatment, within group inequality could actually increase in some of those groups, where the overall inequality portrays a declining pattern. Thus the income shares tell us much about the transfer that is taking place and do not concern themselves with its distribution. From policy perspective not only the reallocation, but also the distribution is of interest to insure the principles of horizontal and vertical equity.

The starting point to analyse the impact of a tax is to choose a measure of inequality. I have limited my choice to the Generalized Entropy family due to its decomposability property. I have four choices for γ and they are - 2.0, - 1.0, - 0.5, and 0.0. Table 2 provides the measured inequality for eleven countries based on gross income (GI) and disposable income (DI) of the households. Our four choices for γ covers a wide range and it allows the analyst to minimize normative judgements. As shown in table 2, the magnitude

of inequality is fairly sensitive to our choice of γ, and as $\gamma \rightarrow 0$, the measured inequality generally gets smaller. Furthermore the relative ranking for each country tends to get effected depending to our choice of γ. At times this charge is rather pronounced. For example USA ranks anywhere from first to fourth in the relative ranking depending on the choice of γ. France's relative ranking is anywhere from second to sixth depending on the choice of γ as well. However for most countries the impact due to our choice of γ is minimal. Also the post tax relative positions of countries change as well. France, Australia, Israel, and Netherland improve upon their relative ranking or maintain their relative ranking with the choice of γ. While USA, Switzerland, Canada, UK, and Sweden lose their position in the relative ranking with particular choices of γ. Norways relative position does not change at all. It is evident that our choice of γ could be important in our view of inequality and tax progressivity. I will limit the remainder of my analysis to our choice of $\gamma = -1.0$. The results based on $\gamma = -2.0$, -0.5, and 0.0 can be made available to those interested.

We can access the impact of tax in each country by looking at a) pre and post tax income distribution; b) an index of progressivity which is the difference between the pre and post income tax distribution, I*, c) the between and average within-group components of I* denoted by I^b* and I^w* and d) the within-group inequality for each quintile. All of the above are provided in table 3 for each of the eleven countries under consideration. I will limit my analysis for the decompositions to Theil's second measure of inequality with $\gamma = -1.0$. This is a member of the Generalized Entropy family of measures which satisfies the income-weighted decomposability property. A complete discussion of the above property is provided in Bourguignon (1979).

Looking at table 3, the overall inequality based on GI (pre tax income) and DI (post tax income) is provided for each of the eleven countries. For

all of the countries the measured inequality based on GI is greater than those based on DI. Looking at the progressivity index $I^* = I_\gamma(y_g) - I_\gamma(y_d)$, all these countries have progressive income taxation. However the degree of progressivity varies across these countries and it is very hard to rank these countries. For example, are income taxes more progressive in France than Australia and Germany? The reduction of inequality in each country is about 22%, while in absolute terms Germany ranks as the lowest. It is my judgement that analysis based on index of progressivity without investigation of the between-group as well as average within-group decompositions is inadequate. For example in the case just cited, it is apparent that in Germany the cross group equalization has been much greater than in France or Australia. However, since within group inequality in each of the five countries has increases due to the progressive tax, it has offset the strength of the decline due to the fall in the between-group component of the overall inequality. That is the between-group fall in inequality constitutes 116% of the overall fall while the average within-group has increased by 16% of the overall fall. Looking at the data for Sweden, it appears that a similar pattern is detected where within-quintile inequality has increased while between-quintitive inequality has fallen. At the same time Sweden enjoys the lowest recorded inequality among all eleven nations. It appears that Germany, Israel, Netherlands, Sweden, United Kingdom, and Norway subscribe to similar patterns of taxation where $I^{b}*$ is falling while $I^{w}*$ is rising. However only in the case of Germany and Sweden the rise is uniform across all quintiles. It is further interesting to note that within-group inequality for quintiles 3 and 4 has increased for all of the eleven nations. It has been argued that this 40% of the population (the middle and upper middle class) has covered most of the tax burden and does not have at its disposal the existing tax breaks.

The movement from lowest quintile to the higher quintiles reveals that inequality among households gets smaller as we move from low income households to high income households. This is particularly true with inequality based on GI and the first four quintiles. This pattern changes with DI to the third quintile. A possible explanation is the fact that in most countries, as the household moves to the higher quintiles, their income gets closer to the mean for that quintile. This is not true for the highest quintiles where the varation is substantial.

It is important to note that our choice of γ does make significant difference in cases of some countries. That is to say both the magnitude, as well as direction of change in inequality due to income taxes are affected. For example with $\gamma = 0.0$, inequality after taxes infact increases in the case of Norway. In most cases the magnitude is effected due to our choice of γ. It is my judgement that covering a wider range of γ's increases reliability.

IV. ARE MULTI-EARNER FAMILIES WORSE OFF?

In the past two decades in most western countries there has been a move toward multi-earner families. There are many explanations for the above changes and many studies have investigated the observed pattern. It is noticeable that barriers for women to enter the labor market are much lower. This does not suggest that the earnings gap has been narrowed. Most women in these countries are in the secondary labor market with lower wages and benefits. It is further evident that families pool their incomes together and try to take advantage of economies of scale. However for tax purposes, it is anticipated that some will subscribe to <u>income splitting</u> if such a provision is allowed. This will make some households better off under certain conditions. It is not clear if multi-earner families are made any better off after taxes, and whether we will observe economics of scale by seeing lower

inequalities among households as the number of earners are increased. Furthermore the observed reduction of overall inequality should be most attributed to the reduction of average within-group inequality. If this is not observed, it could be argued that the tax is distortionary, in a sense that we observe cross-group equalization. A second category of households consists of those who are not engaged in market activity, i.e. retired, or receiving some kind of payment from government.

For each of the eleven countries the following information is provided in table 4. (a) overall inequality based on GI & DI, (b) the between-group and average within-group based on decomposition by the number of earners in the household, (c) the within-group inequality, (d) a measure of overall progressivity i.e. I*, and a measure of group progressivity, i.e. I^*_w, (e) the between and within-group components of I* i.e. I^b* and I^w*. Looking at the results of overall inequality based on GI and DI, the following observations are made:

a. Norway has the highest reported inequality based on GI & DI. It is followed by France and USA while they trade places as we move from GI to DI. Australia and Switzerland follow the same fashion and trade rankings. They are followed by Canada, Israel, and United Kingdom, where the latter two trade place after taxes. The lowest inequality are reported by Germany, Netherland and Sweden, where Netherland takes lowest measured inequality after taxes.

b. The observed change in inequality due to taxes can be connected into a measure of progressivity by looking at the difference of the two distributions denoted by I*. The ranking by tax progressivity, as a percent of pre tax inequality is shown to be; Israel, Netherlands, France, Australia, USA, Canada, United Kingdom, Switzerland, Sweden, and Norway.

It is surprising to see that Israel with high rate of tax progressivity. More surprising is that Sweden with lowest measured pre tax inequality and second lowest post tax inequality to have one of the least progressive tax structures?

The decomposition based on the number of earners in the household are provided in table 4 as well. The following general observations are made.

a. The post tax inequality has created more equalization within each group and it is a larger component of the overall reduction. In case of Sweden it is 100% of the total reduction.

b. Germany and United Kingdom are exceptions to the above observation; and the tax has brought about more cross group equalizations. In the case of Germany, post tax inequality is larger than pre tax for single earner households.

c. It is further observed that in most countries the measured pre and post tax inequality is decreasing as the number of earners is rising. The exceptions are Sweden and Netherlands.

VI. IS THERE A TAX ADVANTAGE FOR LARGER HOUSEHOLDS?

It is a common practice to provide a deduction based on family size to measure the taxable income for households. There are many other deductions involved as well. However this deduction is the most common and straight forward when itemization is not required. It is not clear if this deduction provides incentive to have larger households on one hand, and whether in fact those with smaller households are being penalized. If infact between-group inequality is falling one could argue that this is not desirable simply because households of different sizes are being much more comparable in terms of economic standing. However if the average within group component of overall inequality is declining, households of the same character (size) are

made more equal.

To address the above concerns, decomposition based by the size of family is provided in table 5. The grouping was based on families of size one through five and more. The following observations are made:

a. The average within-group component is the dominant portion of the overall inequality based on GI and DI.

b. The post tax inequality for each group is smaller than the pre tax inequality with two exceptions (Norway and Germany for group five+).

c. The fall in overall inequality after taxes, has resulted in greater reduction within each group thus cross group equalization is minimal.

The above observations indicate that households of same sizes are effected in such fashion that equalization among them has increased. The between-group component of the reduction of the overall inequality constitutes a very small proportion of this reduction, and in the case of Sweden and Norway, it has increased. Thus these countries do infact favor differential treatment of similar households. However in Germany, Israel, Switzerland, and Netherlands, between 32% and 12% of the overall reduction is due to the tax progressivity and it is attributed to the cross group equalizations. Thus in these countries there is stronger tendency for similar treatment of households regardless of size.

There also seems to be a pattern with respect to the size of family and the measured inequality in some of these countries. These measured inequalities for each group gets smaller as the household size gets larger. This is particularly true for households of up to four. The exceptions are Netherlands, France and Switzerland. Thus in some countries there seems to be less of tax incentives available for larger households. Or it could be that larger households are of two different nature. Those who are financially sound and can afford to have larger families, and those who must remain in the

same household to take advantage of economics of scale. Consequently we observe a larger measured inequality. The above patterns are true with respect to within-group tax progressivity. That is generally smaller households have higher progressivity than do larger households of up to four. Taxes are much more penalizing the smaller the households in these countries. The exceptions are once again Netherland, France, and Switzerland, when one cannot detect any unique patterns.

VII. ATKINSON MEASURES AND TWO MEASURES OF TAX PROGRESSIVITY

An alternative approach to measure inequality in each country is to use the measures provided by Atkinson (1970). A brief description of such measures was provided in equation (4), where index of relative inequality is given as $I_{\epsilon}(y)$ and ϵ is the inequality aversion parameter. Looking at table 6, three values of ϵ are used to measure inequality based on gross income (GI), and disposable income (DI) for each of the 11 countries. The ranking of these countries is not much different from those shown in table 2. However there are differences in the magnitude of the measured inequality in each country for each choice of ϵ. Thus it is evident that the choice of ϵ (measure of inequality) effects the measured inequality. Although the relative ranking of each country does not change. The results indicate that as $\epsilon \rightarrow 0$, the measured inequality gets smaller as well. This is true regardless of the choice of household income i.e. GI vs DI. As anticipated the post tax distribution is more equal. Thus $I_{\epsilon}(y_d)$ is smaller than $I_{\epsilon}(y_g)$. The after tax ranking of Netherland and Israel has improved regardless of the choice of ϵ. The opposite holds true for Sweden, UK, Switzerland, and Germany. Using Atkinson Measures Kiefer (1985) suggested progressivity index given in equation (9), i.e. P_{ϵ}. The results based on this index are given in table 6. It is clear that generally as $\epsilon \rightarrow 0$, the measured P_{ϵ} gets smaller.

The exceptions are those for the USA and France. In absolute terms, the reduction in the measured inequality has been substantial for Israel, Netherland, and Germany. Also these are countries with some of the lowest observed inequalities. The magnitude of our observations and those results are sensitive to the choice of ϵ.

Using these same measures, Blackorby and Donaldson (1984) approached the concept of progressivity differently. For them, the measured progressivity is basically 1- inequality. This is shown in equation (10) to be as P^*_ϵ. The results based on P^*_ϵ are shown in table 6 as well. P^*_ϵ is very much sensitive to the choice of ϵ. The following observations are made about such an index:

a) as $\epsilon \to 0$, P^*_ϵ gets smaller.

b) countries such as USA, Norway, and France, could be viewed as having the most progressive index and the least progressive index depending on the choice of ϵ. Thus there is normative judgement to be made about the tax system in each of these countries.

c) the ranking of Israel, Australia, Netherlands, Germany, Canada, UK, and Sweden does not change much with the choice of ϵ.

It is evident from our observations above that one needs to look at a family of such measures in order to broaden our view of the existing pre and post income tax distribution. More importantly the decompositions are crucial to learn about the source of inequality and the fashion in which it is changing after taxes.

VIII. CONCLUSION

This paper has provided comparison of pre and post income tax inequality among households in eleven different countries. I further have introduced a measure of tax progressivity using Generalized Entropy Measures. It has been shown the desirability of the decomposition property in order to learn about

factors that might contribute to inequality and further might be a source in which provide after tax benefits. It is clear that generally there is reduction of inequality after taxes. However at the same time within group inequality might have increased. Taxes are shown to be progressive in each of these countries. However our view of progressivity to a large extent depends upon the choice of inequality measure (γ or ϵ). Thus one has to be very cautious making judgements about the nature and the effect of income taxation. This study has also shown the richness of the data sets currently available in LIS. The family of progressivity indices based on Entropy Measures, and Atkinson Measures show the sensitivity of our results to the choice of inequality measures used.

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TABLE 1

PRE & POST TAX INCOME SHARE BY QUINTILE

Country		Quint 1	Quint 2	Quint 3	Quint 4	Quint 5	Sample Size
Canada	GI	.049	.112	.178	.251	.409	4478
1981	DI	.056	.122	.184	.249	.389	
USA	GI	.041	.098	.165	.251	.445	4468
1979	DI	.050	.113	.176	.254	.407	
Germany	GI	.061	.126	.182	.247	.383	2787
1981	DI	.077	.140	.184	.245	.354	
Israel	GI	.052	.114	.171	.246	.417	2271
1979	DI	.069	.132	.186	.243	.370	
Netherlands	GI	.069	.128	.177	.244	.382	4747
1983	DI	.087	.139	.178	.240	.355	
Sweden	GI	.070	.129	.181	.198	.422	4754
1981	DI	.084	.140	.186	.201	.390	
UK	GI	.050	.108	.183	.252	.407	6878
1979	DI	.059	.116	.184	.250	.391	
France	GI	.051	.097	.143	.205	.505	5454
1979	DI	.059	.109	.158	.221	.453	
Norway	GI	.031	.072	.113	.168	.616	5114
1979	DI	.042	.083	.122	.168	.585	
Switzerland	GI	.057	.117	.161	.214	.450	6877
1982	DI	.065	.124	.166	.215	.431	
Australia	GI	.047	.104	.173	.249	.428	4730
1981	DI	.058	.119	.180	.248	.395	

TABLE 2

RANKING BY GENERALIZED ENTROPY FAMILY OF MEASURES

		Rank	$\gamma = -1.0$	Rank	$\gamma = -2.0$	Rank	$\gamma = -0.5$	Rank	$\gamma = 0.0$
Norway	GI	(1)	.6016	(2)	1.1643	(1)	.6290	(1)	.8474
	DI	[1]	.5361	[2]	.8645	[1]	.6119	[1]	.9436
France	GI	(2)	.3508	(6)	.5927	(2)	.3514	(2)	.4073
	DI	[3]	.2737	[6]	.4782	[2]	.2655	[2]	.2882
USA	GI	(3)	.3426	(1)	1.5697	(3)	.2902	(4)	.2739
	DI	[2]	.2762	[1]	1.2495	[3]	.2331	[4]	.2175
Aust.	GI	(4)	.2997	(3)	1.0835	(5)	.2605	(5)	.2506
	DI	[5]	.2323	[3]	.8225	[5]	.2020	[5]	.1924
Swiss	GI	(5)	.2875	(4)	.7689	(4)	.2051	(3)	.3318
	DI	[4]	.2509	[4]	.5996	[4]	.2497	[3]	.2864
Canada	GI	(6)	.2695	(5)	.6840	(7)	.2324	(7)	.2187
	DI	[6]	.2293	[5]	.5629	[6]	.1990	[7]	.1873
Israel	GI	(7)	.2573	(8)	.3978	(6)	.2356	(6)	.2333
	DI	[8]	.1840	[9]	.2549	[8]	.1732	[8]	.1750
UK	GI	(8)	.2512	(7)	.4207	(8)	.2259	(8)	.2166
	DI	[7]	.2135	[7]	.3413	[7]	.1962	[6]	.1912
Germany	GI	(9)	.2025	(11)	.3262	(9)	.1831	(9)	.1764
	DI	[9]	.1574	[10]	.2356	[9]	.1454	[9]	.1421
Neth.	GI	(10)	.1897	(10)	.3306	(10)	.1719	(10)	.1677
	DI	[11]	.1439	[11]	.2309	[11]	.1328	[11]	.1305
Sweden	GI	(11)	.1854	(9)	.3584	(11)	.1659	(11)	.1599
	DI	[10]	.1611	[8]	.2927	[10]	.1436	[10]	.1369

TABLE 3- REDISTRIBUTION THROUGH TAXATION, GE BY QUINTILE, $\gamma = -1.0$

	Overall	Between	Within	Quint 1	Quint 2	Quint 3	Quint 4	Quint 5
Country: Canada 1981								
GI	0.2695	0.2318	0.0378	0.1327	0.0155	0.0056	0.0051	0.0300
DI	0.2293	0.1925	0.0370	0.1293	0.0141	0.0070	0.0068	0.0275
I^*, I^{b*}, I^{w*}	0.0402	0.0393	0.0008					
D^o, D^b, D^w	1.0	0.9776	0.0199					
Country: USA 1979								
GI	0.3426	0.2936	0.0492	0.1777	0.0157	0.0093	0.0065	0.0369
DI	0.2762	0.2289	0.0474	0.1759	0.0153	0.0097	0.0072	0.0293
I^*, I^{b*}, I^{w*}	0.0664	0.0647	0.0018					
D^o, D^b, D^w	1.0	0.9744	0.0271					
Country: Germany, 1981								
GI	0.2025	0.1761	0.0265	0.0817	0.0099	0.0039	0.0040	0.0333
DI	0.1574	0.1237	0.0338	0.0844	0.0136	0.0159	0.0120	0.0432
I^*, I^{b*}, I^{w*}	0.0451	0.0524	-0.0073					
D^o, D^b, D^w	1.0	1.1619	-0.1619					
Country: Israel, 1979								
GI	0.2573	0.2251	0.0323	0.0859	0.0099	0.0055	0.0060	0.0542
DI	0.1840	0.1495	0.0345	0.0740	0.0145	0.0132	0.0146	0.0566
I^*, I^{b*}, I^{w*}	0.0733	0.0756	-0.0022					
D^o, D^b, D^w	1.0	1.0314	-0.0300					
Country: Netherlands, 1983								
GI	0.1897	0.1589	0.0309	0.1068	0.0074	0.0037	0.0046	0.0323
DI	0.1439	0.1113	0.0327	0.1019	0.0102	0.0092	0.0105	0.0320
I^*, I^{b*}, I^{w*}	0.0458	0.0476	-0.0018					
D^o, D^b, D^w	1.0	1.0393	-0.0393					
Country: Sweden, 1981								
GI	0.1854	0.1516	0.0339	0.1223	0.0058	0.0036	0.0026	0.0307
DI	0.1611	0.1106	0.0507	0.1378	0.0270	0.0247	0.0248	0.0369
I^*, I^{b*}, I^{w*}	0.0243	0.0410	-0.0168					
D^o, D^b, D^w	1.0	1.6872	-0.6914					
Country: UK, 1979								
GI	0.2512	0.2313	0.0202	0.0366	0.0233	0.0053	0.0045	0.0311
DI	0.2135	0.1918	0.0219	0.0382	0.0206	0.0092	0.0075	0.0340
I^*, I^{b*}, I^{w*}	0.0377	0.0395	-0.0017					
D^o, D^b, D^w	1.0	1.0477	-0.0451					
Country: France, 1979								
GI	0.3508	0.2958	0.0551	0.0988	0.0077	0.0054	0.0069	0.1567
DI	0.2737	0.2291	0.0448	0.1001	0.0081	0.0060	0.0073	0.1027
I^*, I^{b*}, I^{w*}	0.0771	0.0667	0.0103					
D^o, D^b, D^w	1.0	0.8651	0.1336					
Country: Norway, 1979								
GI	0.6016	0.5035	0.0983	0.0973	0.0172	0.0064	0.0070	0.3640
DI	0.5361	0.4090	0.1272	0.0940	0.0182	0.0132	0.0178	0.4933
I^*, I^{b*}, I^{w*}	0.0655	0.0945	-0.0289					
D^o, D^b, D^w	1.0	1.4427	-0.4412					
Country: Switzerland, 1981								
GI	0.2875	0.2267	0.0610	0.1268	0.0080	0.0032	0.0039	0.1622
DI	0.2509	0.1941	0.0570	0.1180	0.0087	0.0040	0.0050	0.1487
I^*, I^{b*}, I^{w*}	0.0366	0.0326	0.0040					
D^o, D^b, D^w	1.0	0.8907	0.1093					
Country: Australia, 1981								
GI	0.2997	0.2559	0.0440	0.1420	0.0209	0.0062	0.0060	0.0448
DI	0.2323	0.1930	0.0395	0.1392	0.0149	0.0067	0.0063	0.0304
I^*, I^{b*}, I^{w*}	0.0674	0.0629	0.0045					
D^o, D^b, D^w	1.0	0.9332	0.0668					

TABLE 4 - REDISTRIBUTION THROUGH TAXATION, GE BY NUMBER OF EARNERS, $\gamma = -1.0$

	Overall	Between	Within	One	Two	Three	None
Country: Canada, 1981							
GI	0.2695	0.0902	0.1794	0.2349	0.1126	0.0959	0.2348
DI	0.2293	0.0787	0.1507	0.1965	0.0901	0.0770	0.2094
I^*, I^{b*}, I^{w*}	0.0402	0.0115	0.0287	0.0384	0.0225	0.0189	0.0254
D^o, D^b, D^w	1.0	0.2861	0.7139				
Country: USA, 1979							
GI	0.3427	0.1056	0.2372	0.3023	0.1430	0.1058	0.3079
DI	0.2762	0.0824	0.1939	0.2451	0.1039	0.0802	0.2803
I^*, I^{b*}, I^{w*}	0.0665	0.0232	0.0433	0.0572	0.0391	0.0256	0.0276
D^o, D^b, D^w	1.0	0.3489	0.6511				
Country: Germany, 1981							
GI	0.2026	0.0952	0.1074	0.1023	0.0738	0.0505	0.1610
DI	0.1575	0.0505	0.1069	0.1032	0.0724	0.0462	0.1598
I^*, I^{b*}, I^{w*}	0.0451	0.0447	0.0005	-0.0009	0.0014	0.0043	0.0012
D^o, D^b, D^w	1.0	0.9911	0.0111				
Country: Israel, 1979							
GI	0.2573	0.0625	0.1948	0.1974	0.1063	0.0869	0.3639
DI	0.1840	0.0392	0.1448	0.1286	0.0720	0.0571	0.3554
I^*, I^{b*}, I^{w*}	0.0733	0.0233	0.0500	0.0688	0.0343	0.0298	0.0085
D^o, D^b, D^w	1.0	0.3179	0.6821				
Country: Netherlands, 1983							
GI	0.1898	0.0543	0.1355	0.1268	0.1219	0.1872	0.1510
DI	0.1440	0.0402	0.1038	0.0977	0.0949	0.1327	0.1149
I^*, I^{b*}, I^{w*}	0.0458	0.0141	0.0317	0.0291	0.0270	0.0545	0.0361
D^o, D^b, D^w	1.0	0.3079	0.6921				
Country: Sweden,							
GI	0.1854	0.0531	0.1325	0.1613	0.0631	0.1093	0.1839
DI	0.1612	0.0531	0.1082	0.1369	0.0422	0.0988	0.1353
I^*, I^{b*}, I^{w*}	0.0242	0.0000	0.0242	0.0244	0.0209	0.0105	0.0486
D^o, D^b, D^w	1.0	0.0000	1.0000				
Country: UK, 1979							
GI	0.2513	0.1395	0.1119	0.1420	0.0747	0.0588	0.1433
DI	0.2136	0.1170	0.0967	0.1247	0.0657	0.0544	0.1184
I^*, I^{b*}, I^{w*}	0.0377	0.0225	0.0152	0.0173	0.0090	0.0044	0.0247
D^o, D^b, D^w	1.0	0.5968	0.4032				
Country: France, 1979							
GI	0.3508	0.0349	0.3160	0.3703	0.2173	0.1552	0.3732
DI	0.2738	0.0354	0.2385	0.2931	0.1554	0.1157	0.2614
I^*, I^{b*}, I^{w*}	0.0770	-0.0005	0.0775	0.0772	0.0619	0.0395	0.1118
D^o, D^b, D^w	1.0	-0.0065	1.0065				
Country: Norway, 1979							
GI	0.6016	0.1064	0.4953	0.6727	0.2437	0.1512	0.4359
DI	0.5361	0.0896	0.4466	0.6410	0.2335	0.0965	0.2914
I^*, I^{b*}, I^{w*}	0.0655	0.0168	0.0487	0.0317	0.0102	0.0547	0.1445
D^o, D^b, D^w	1.0	0.2565	0.7435				
Country: Switzerland, 1982							
GI	0.2875	0.0498	0.2378	0.2691	0.1245		0.2762
DI	0.2510	0.0410	0.2101	0.2431	0.1073		0.2301
I^*, I^{b*}, I^{w*}	0.0365	0.0088	0.0277	0.0260	0.0172		0.0461
D^o, D^b, D^w	1.0	0.2411	0.7589				

TABLE 5 - REDISTRIBUTION THROUGH TAXATION, GE BY FAMILY SIZE, $\gamma = -1.0$

	Overall	Between	Within	One	Two	Three	Four	Five+
Country: Canada, 1981								
GI	0.2695	0.0562	0.2134	0.3125	0.2263	0.1744	0.1471	0.1448
DI	0.2293	0.0552	0.1742	0.2568	0.1811	0.1433	0.1228	0.1174
I^*, I^{b*}, I^{w*}	0.0402	0.0010	0.0392	0.0557	0.0452	0.0311	0.0243	0.0274
D^o, D^b, D^w	1.0	0.0249	0.9751					
Country: USA, 1979								
GI	0.3427	0.0642	0.2786	0.3574	0.2888	0.2331	0.2066	0.2123
DI	0.2762	0.0623	0.2140	0.2764	0.2157	0.1822	0.1612	0.1650
I^*, I^{b*}, I^{w*}	0.0655	0.0019	0.0646	0.0810	0.0731	0.0509	0.0454	0.0473
D^o, D^b, D^w	1.0	0.0286	0.9714					
Country: Germany, 1981								
GI	0.2025	0.0627	0.1399	0.1944	0.1790	0.1000	0.0786	0.0850
DI	0.1574	0.0481	0.1093	0.1422	0.1305	0.0889	0.0661	0.0880
I^*, I^{b*}, I^{w*}	0.0451	0.0146	0.0306	0.0522	0.0485	0.0111	0.0125	-0.0030
D^o, D^b, D^w	1.0	0.3237	0.6785					
Country: Israel, 1979								
GI	0.2573	0.0398	0.2175	0.3742	0.3118	0.1666	0.1505	0.1588
DI	0.1840	0.0289	0.1551	0.2666	0.2401	0.1135	0.1076	0.1013
I^*, I^{b*}, I^{w*}	0.0733	0.0109	0.0624	0.1074	0.0717	0.0531	0.0429	0.0575
D^o, D^b, D^w	1.0	0.1487	0.8513					
Country: Netherlands, 1983								
GI	0.1897	0.0265	0.1632	0.1697	0.1478	0.1974	0.1272	0.2190
DI	0.1439	0.0211	0.1229	0.1172	0.1058	0.1538	0.1032	0.1778
I^*, I^{b*}, I^{w*}	0.0458	0.0054	0.0403	0.0525	0.0420	0.0436	0.0240	0.0412
D^o, D^b, D^w	1.0	0.1179	0.8799					
Country: Sweden, 1981								
GI	0.1854	0.0305	0.1550	0.2168	0.1571	0.1333	0.1178	0.1172
DI	0.1612	0.0353	0.1259	0.1631	0.1261	0.1158	0.1044	0.0993
I^*, I^{b*}, I^{w*}	0.0242	-0.0048	0.0291	0.0537	0.0310	0.0175	0.0134	0.0179
D^o, D^b, D^w	1.0	-0.1983	1.2025					
Country: England, 1979								
GI	0.2512	0.0889	0.1625	0.2258	0.1884	0.1212	0.0981	0.1150
DI	0.2135	0.0858	0.1279	0.1647	0.1446	0.1040	0.0877	0.1003
I^*, I^{b*}, I^{w*}	0.0377	0.0031	0.0346	0.0611	0.0438	0.0172	0.0104	0.0147
D^o, D^b, D^w	1.0	0.0822	0.9178					
Country: France, 1979								
GI	0.3508	0.0657	0.2852	0.2310	0.3602	0.2809	0.2530	0.2606
DI	0.2738	0.0627	0.2112	0.1915	0.2537	0.2037	0.1860	0.1990
I^*, I^{b*}, I^{w*}	0.0770	0.0030	0.0740	0.0395	0.1065	0.0772	0.0670	0.0616
D^o, D^b, D^w	1.0	0.0390	0.9610					
Country: Norway, 1979								
GI	0.6016	0.0698	0.5320	0.6618	0.5912	0.3344	0.2841	0.5784
DI	0.5361	0.0731	0.4631	0.5366	0.5149	0.2820	0.2521	0.6301
I^*, I^{b*}, I^{w*}	0.0655	-0.0033	0.0689	0.1252	0.0763	0.0524	0.0320	-0.0517
D^o, D^b, D^w	1.0	-0.0504	1.0519					
Country: Switzerland, 1982								
GI	0.2875	0.0642	0.2234	0.2512	0.2687	0.1570	0.1442	0.1606
DI	0.2509	0.0597	0.1914	0.2151	0.2236	0.1379	0.1337	0.1430
I^*, I^{b*}, I^{w*}	0.0366	0.0045	0.0320	0.0361	0.0451	0.0191	0.0105	0.0176
D^o, D^b, D^w	1.0	0.1230	0.8743					

TABLE 6

REDISTRIBUTION THROUGH TAXATION

ATKINSON MEASURES

Country	Choice of ϵ	Overall GI	Overall DI	P_ϵ	P^*_ϵ
Canada	2.0	0.5777	0.5296	0.0481	0.1139
1981	1.0	0.2362	0.2049	0.0313	0.0410
	0.5	0.1128	0.0970	0.0158	0.0178
USA	2.0	0.7584	0.7142	0.0442	0.0730
1979	1.0	0.2901	0.2414	0.0487	0.0596
	0.5	0.1398	0.1132	0.0266	0.0292
Germany	2.0	0.3948	0.3203	0.0745	0.1231
1981	1.0	0.1833	0.1456	0.0377	0.0462
	0.5	0.0895	0.0714	0.0181	0.0199
Israel	2.0	0.4431	0.3376	0.1055	0.1894
1979	1.0	0.2268	0.1681	0.0587	0.0759
	0.5	0.1143	0.0847	0.0296	0.0334
Netherlands	2.0	0.3981	0.3160	0.0821	0.1364
1983	1.0	0.1728	0.1340	0.0388	0.0469
	0.5	0.0841	0.0653	0.0188	0.0205
Sweden	2.0	0.4175	0.3693	0.0482	0.0827
1981	1.0	0.1692	0.1488	0.0204	0.0246
	0.5	0.0812	0.0705	0.0107	0.0116
UK	2.0	0.4570	0.4057	0.0513	0.0945
1979	1.0	0.2222	0.1923	0.0299	0.0384
	0.5	0.1098	0.0957	0.0141	0.0158
France	2.0	0.5424	0.4889	0.0535	0.1169
1979	1.0	0.2959	0.2395	0.0564	0.0801
	0.5	0.1680	0.1284	0.0396	0.0476
Norway	2.0	0.6996	0.6336	0.0660	0.2197
1979	1.0	0.4521	0.4150	0.0371	0.0677
	0.5	0.2898	0.2825	0.0073	0.0103
Switzerland	2.0	0.6060	0.5453	0.0607	0.1541
1982	1.0	0.2499	0.2219	0.0280	0.0373
	0.5	0.1375	0.1210	0.0165	0.0191
Australia	2.0	0.6842	0.6219	0.0623	0.1973
1981	1.0	0.2590	0.2073	0.0517	0.0698
	0.5	0.1260	0.0985	0.0275	0.0315